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ROSWELL DISTRICT

Vegetation Description and Analysis from Literature Reviews for Creosotebush Vegetative Subtype In The Roswell District Bureau of Land Management

1977

Developed from a report prepared by Wayne Ellison, Range Conservationist, Roswell BLM District

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CREOSOTEBUSH VEGETATIVE SUBTYPE
DESCRIPTION

I. Introduction

The purpose of this description is to provide information for writing Allotment Management Plans for the Roswell BLM District.

Relief varies from nearly level to gently sloping plains and mesa tops to strongly sloping and rolling hills.

This subtype often produces only fair to poor vegetation for livestock forage due to the shallow droughty soils, and low rainfall.

Livestock presently graze on all of the federal lands within this creosote bush subtype.

The highest density of 15-30% canopy cover is confined primarily to the Simon-Parjarito soil association. (1) Creosote bush distribution is associated with soils high in calcium carbonate. (2) The plant reaches its best development on the limestone alluvial fans with high gravel content.

II. Vegetative Description

A. Species Composition of the Perennial vegetation

In the past, the area has supported tall and mid-grasses of the Andropogon, Bouteloua and Sporobolus genera with varying amounts of shrubs.(1)

B. Common Forbs Found on the Subtype

Crotons, senna, bladderpod mustard, trailing four

Oclock, white horsenettle, spurge, zinnia spp., krameria spp., and coldenia gossy king.

C. Important Cool Season Species

None.

D. Important Warm Season Species

Black grama, blue grama, little bluestem, burrograss, bush muhly, fluffgrass, hairy grama, sacatone, sideoats grama, three-awn, and tobosa.

E. Desirable Forage Shrubs

About the only shrubs found in the creosotebush subtype that have any forage value are longleaf Mormon tea and mesquite. The mesquite's value is mainly in it's seed pods, which are sweet, rich in protein, and very nutritious.

F. Poisonous Plants - Broom Snakeweed, Mesquite, (Creosotebush)

1. Snakeweed - The effects of injestion of snakeweed by livestock include death and abortion, the producer of weak and light calves, and the retention of the placenta by the cow even when dropping a normal healthy calf.(12)

2. Mesquite - Long continued consumption of pods and leaves may cause rument impaction and poisoning. After a wet period the pods that have been lying on the

ground will become sour and unfit for food.

3. Creosotebush - Earlier reports accusing creosotebush of being poisonous have been proven wrong.(12)

G. Endangered, Threatened, and Endemic Taxic

Presently, there is no list of identified endangered species on this area. After the range survey of the area is completed, a list will be developed, if plants are identified.

H. Present Production

Creosotebush itself is worthless as a forage in all seasons and to all present classes of livestock. Usually very little palatable vegetation grows in a dense creosotebush subtype; hence, the carrying capacity of such areas are either very low or nil.(13) In less dense stands good understory vegetation of forbs and grasses does occur with carrying capacities sometimes reaching an estimated high of 8 - 10 ac/AUM.

Creosotebush goes so far in it's fight for survival as to give off a substance from the tip of it's roots that kills other large plants that attempt to compete with it for water supply.(3)

Forage species normally cannot reestablish on a creosotebush sites with a canopy density of 30% or higher.(11)

III. Soils, Physiography and Erosion

The creosotebush vegetative subtype in the Roswell District is located primarily on one major soil association, the Simona-Pajarito. Creosotebush does, however, occur on the Reagon-Upton soil associations and also on the Reeves-Gypsum.

Although there are small, scattered areas of deep soils are predominantly shallow, droughty and underlain by fractures. Surface layers vary from gravelly loam to loamy fine sand.(1)

Creosotebush plants provide little soil protection from wind and water erosion. Erosion is a major factor that contributes to creosotebush invasion. Continuous selective grazing causes deterioration of herbacious ground cover and allows an increase of soil erosion.(11)

IV. Effects of Climate on Vegetation

A. Temperature and Growing Season

The average growing season for this area is around 200 days with a variation of average annual lows in January of from 24° to 38°F, and average annual highs in July of from 64° to 92°F. (1)

B. Precipitation and it's Effects on Vegetation

Average annual precipitation is 12-14 inches, with frequent low rainfall years of 3-4 years in duration. East of the Pecos River (during the 1951-56 drought) much of the

black grama cover was lost on the deep soils; the more sandy the soil the greater the loss. Creosotebush generally invades sites where the original grass stand has been depleted.(9) The creosotebush plant appears to suffer the least of all the plants from droughts. Creosotebush is severely damaged by prolonged periods below $-18^{o}C$. ($0^{o}F$) but has a good capacity for regrowth. The plants leaves can survive a reduction in water content to less than 50% of their weight, and a saturation deficit of at least 77%; these values are the most extreme yet measured for any species. The plant has the ability to take in and store free soil water, consequently it survives the worst of droughts.(15)

C. Winds and Water Losses

Due to the shallow soils, underlayers of caliche, and small amounts of vegetation cover, the soil is highly susceptible to water run-off. Wind erosion is often excessive. Herbel states that as much as 7 inches of top soil has been lost from areas invaded by creosotebush.(9)

V. Succession Changes

Selective grazing by livestock contributes to ground cover deterioration thus providing an environment more suitable to creosotebush.(11)

Phases of retrogression - black grama, bush muhly, plains bristlegrass, mesa dropseed, four-wing saltbush - three-awns, fluffgrass, and annuals - catclaw, javelina bush, mesquite, and creosotebush - creosotebush.

This shift from productive and protective per annual grass cover to the creosotebush subtype may be rapid and extreme.(15)

VI. Herbage Production

The General Land Office survey records from the "Jornada Experimental Range" in southern New Mexico, show that in 1915 the rangeland was made up of extensive areas of black grama (Bouteloua eriopoda). A following survey (completed in 1934) twenty years later show that the area was entirely replaced by creosotebush. Clippings from this range site in 1925 was 768 lbs. per acre. By 1940 the site was dominated by creosotebush with little or no herbaceous ground cover.(15) For the most part production is considerably higher in the Roswell District, however, rapid deterioration of herbaceous ground cover could occur.

Once the creosotebush canopy reaches the 15-30% density the competing vegetation will usually deteriorate rapidly from a combination of climatic stress, erosion, grazing, and plant competition.(11)

VII. Potential Key Species of the Type

A. Black Grama

This grass is one of the major species on light to medium textured soils. It makes virtually all of its growth in the summer growing season. It cannot persist on shifting sand and soon dies when sand is deposited on it or blows out from

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base. This is one major reason why it must not be overutilized. The sandy sites are so fragile that wind erosion is always a potential problem, and once wind erosion starts, black grama will soon die out. Black grama spreads almost entirely by stolens and tillers. Rooting at the nodes of prostrate stems followed by separation from the parent plant, and the development of new stems from the perimeter of the root crown, are especially prominent in favorable moisture years, if the plants have not been over-utilized the previous season. Over-utilized plants will have little or no reproduction. Black grama has perennial culms; they do not die back to the crown each year but remain green through the winter and spring period.(8) The stems store plant reserves, as do the crown and roots. That is why black grama is especially sensitive to over-utilization even during the dormant season.(15)

B. Tobosa

Poor forage for wildlife, fair forage for livestock. It greens up readily after a rain and turns ash gray and course during drought. Tobosa grows on the heavier textured soils, it is quite productive on well watered flood plain sites. When it is mature tobosa is relatively unpalatable. Tobosa has perennial clums, they do not die back to the crown each year but remain green through the winter and spring period. This plant too stores reserves in the stems, crowns,

and roots, that's why it is especially sensitive to over-utilization even during the dormant season.(15)

C. Sideoats Grama

Sideoats grama is palatable and productive. It grows earlier in the spring and later in the fall than blue grama. It maintains a fairly high feeding value throughout the year. The species is soon killed by improper grazing. Many ranges that formerly had large quantities of this grass now produce little.(6)

VIII. Requirements of Forage Plants and Phenology

A. Cool Season Grasses and Sedges

Growth of cool season grasses is at a moderate rate during the spring, then declines to a low rate from spring through mid-July. Growth rate begins to decrease in May and June, if no precipitation falls, may go into a period of semi-dormancy.

B. Warm Season Grasses

Leaves and stems of warm season grasses brown for at least a short period during the winter. The dormant period is usually from late November to early March, except for black grama and tobosa which often retain some greenness in the stem throughout the winter.

The main summer growing season, which begins about the first week of July and ends about September 15 is the time

of best growth of most warm season species.

In mid-July and early August, the warm season grasses begin to develop flower stalks and increase rapidly in height. The warm season grasses begin their surge of growth when the soil warms up to 60° or 65°. In dry years only a few flower stalks develop and the plant height remains much the same as is normal in June.

Timing of plant growth corresponds, in general, with timing of seasonal precipitation. Growth may be delayed when rains are later than usual, but there is good evidence that rains earlier than usual do not result in earlier than usual growth of warm season grasses. In order to favor warm season grasses in a grazing system, they should be rested or deferred from grazing from about July 15 to October 15, in order to restore vigor and allow for seed production.

C. Forage Shrubs

Most shrubs are dormant during the winter, although some of the twigs and stems on some species appear to remain active and somewhat succulent.

New stems are produced each year from the tip of the previous years stems and from the woody crown of the plants. In years of exceptional dryness, very little or no new growth occurs.

Most shrubs begin growth in the spring around mid-March and continue growing to about mid-May at which time (like

warm season grasses) go dormant, because there is insufficient soil moisture for active growth. Flowering takes place from April to Aguust with seed ripening and maturity occuring during late summer.

Proper use of most forage shrubs during winter grazing period without impairing seed production should not be over 50%.

IX. Analysis of Any Treated Areas

Where creosotebush has been controlled, the reinvasion has been impressive. On the Jornada, creosotebush reached a 11% density in 12 years after control. More interesting in this study is the fact that creosotebush reinvaded to 22% in 12 years under exclusion of livestock and rodents.(11) In the Roswell District it appears that soils play a major roll in the effectiveness of creosotebush control. Soil surveys made by the SCS indicate that creosotebush found other than on the "limestone hills" range site and on the "shallow" range site, may have a good chance for success. One study plot made in 1969, in T. 20 S., R. 29E, Section 36, indicates a high level of success at the present time (1977) almost 8 years after treatment. In the trial, the method used was root knifing with plant removal, followed by seed planting and then replacement of removed plants back on the soil surface for a little cover. The soil mapping unit in the area of the trial was "largo loam" and the range

site to a density of about 20% canopy around cover. Interspaces between creosotebushes have still maintained a good cover of herbacious species.

Many different kinds of herbicides have been tested (including fuel oil) at N.M.S.U. at Las Cruces; the chemical that ranked highest as a creosotebush killer was PICLORAM. Results of some spraying tests are shown in Table 1.

Table 1. Average kill of creosotebush sprayed with various herbicides, 1962-1964

Herbicide			Percent of Plants Killed		
Common name	Chemical name	Formulation and company[1]	1962	1963	1964
2,4-D	2,4-dichlorophenoxy acetic acid	Acid, Weedone 638, Dow	1	0	0
2,4-D	2,4-dichlorophenoxy acetic alkonolomine salt	Alkanolomine salt, Formulo 40, Dow	0	0	^
2,4-D	2,4-dichlorophenoxy acetic tertiory dodecyl primary amine salts	Amine salt, Emulsomine E-3, Amchem	0	0	U
2,4-D	2,4-dichlorophenoxyacetic propylene glycol butyl ether esters	Ester, Esterone 99, Dow	3	0	0
2,4-D	2,4-dichlorophenoxyacetic butoxy ethanol ester	Ester, Weedone LV 4, Amchem	4	2	0
2,4-D	2,4-dichlorophenoxyacetic isooctyl ester	Ester, Weed Rhop 24 D, Reosor-Hill	4	0	0
2,4-D	2,4-dichlorophenoxypropionic isooctyl ester	Ester, Brush Rhop 24 DP, Reosor-Hill	1	0	0
MCP	2-methyl, 4-chlorophenoxy acetic olkonolomine salt	Amine, MCP Weed Killer, Dow	0	0	0
2,4-D and 2,4,5-T	2,4-dichlorophenoxyacetic PGBE esters, 26.5 pct.; 2,4,5-trichlorophenoxy acetic PGBE esters, 25.2 pct.	Esters, Forron, Dow	0	1	0
2,4,5-T	2,4,5-trichlorooacetic triethylamine salt	Amine, Veon 245, Dow	0	0	0
2,4,5-T	2,4,5-trichlorophenoxyacetic PGBE esters	Ester, Weedone 245T, Dow	6	1	0
2,4,5-T	2,4,5-trichlorophenoxyacetic butoxy ethanol ester	Ester, Weedone 245T, Amchem	2	3	0
2,4,5-T	2,4,5-trichlorophenoxyacetic isooctyl ester	Ester, Brush Rhop 245T, Reosor-Hill	4	0	1
2,4,5-TP	2,4,5-trichlorophenoxypropionic PGBE esters	Ester, Kuron, Dow	0	0	0
2,4,5-TP	2,4,5-trichlorophenoxypropionic ethyl hexyl ester	Ester, SilviRhop, Reosor-Hill	3	0	0
Piclorom[2]	4-omino-3,5,6-trichloro-picolinic acid	Acid, Tordon, Dow	—	48	25

[1] Mention of company trade mark and company name is for identification purposes only and does not constitute endorsement of the product.
[2] Not cleared for general use by U.S. Department of Agriculture.

1970

Spraying in the fall produced higher kills than in the spring. It's advisable to defer a pasture for 60-90 days after spraying to reduce the chance of livestock poisoning.

It's a good idea to check with the nearest USDA Experiment Station for any new developments in their latest experiments.

X. Any Conversion Treatment Considerations

The brush has to be controlled before the range can derive the greatest benefits from other practices such as grazing management plan, seeding, or water spreading.

The most effective method for control of woody plants depends upon the site, the specific vegetation and the degree of infestation. Any control job requires considerable attention to detail for maximum benefit per dollar spent.

On sandy soils mechanical method is usually avoided because of wind erosion.

On heavy soils with heavy brush and a poor stand of desirable plants, its best to root plow and reseed.

Brush control generally costs less when invasion is just beginning and the plants are small and scattered. In this situation, the best method is one that will not destroy the residual forage plants.(10)

XI. Seeding Considerations

Where vegetation has been severely depleted by past grazing abuses, droughts, and encroachment of brush, natural recovery may take years, or it may never occur. On such sites, seeding is the only hope of revegetation. But establishing seeded species is

difficult and expensive. Since summer is the only season with reliable rainfall, the seedlings must be established in hot weather. Many species are small seeded, requiring shallow planting. Precipitation is limited, evaporation is rapid, and soil surfaces often crust over.(9)

When seeding, its important to choose a mixture of native species. Drilling is the best procedure.

Broadcasting is not the best method of seeding, but if rootplowing is being considered, then broadcasting seed at the same time should be considered, as a one time over operation.

XII. Type Conversion Treatment Recommendations

A. Rootplowing

Rootplowing with a tract-type tractor, comparable in size to a D-6 or larger, with a root plow, plowing to a depth of 7 to 10 inches is very effective. A drag chain, on swivels, behind the plow increases the puul-up of plants.

1. Rootplowing kills all vegetation except cactus and leaves the soil loose and fluffy.

2. Good creosotebush kills can be obtained with discing with a couble-disc to a minimum depth of six inches; mechanical grubbing of individual plants; hand grubbing of individual plants, and completely ringing the base of the stem with diesel oil following frost in the fall of the year.

3. Ground spraying using DICAMBA at ½ lb. per acre in a total volume of five gallons per acre, followed the next year with DICAMBA at 2 lbs. per acre is very effective - should be applied between mid-August and mid-September.(7)

4. Fire is effective in killing creosotebush, but has several drawbacks such as needed fuel accumulation, fire control and poor aesthetic consequences.

5. Biological control - defoliation of creosotebush by walking sticks.

In the Trans-Pecos region of Texas, infestation of walking stick into a creosotebush area completely defoliated and weakened the creosotebush plants to the extent that the surrounding primary grasses increased over 100%.

From a range management (livestock program) viewpoint there is no economical method of treatment to stop the succession of creosotebush.

See following table.

Defoliation of Creosotebush by Walkingsticks Increases Forage Production

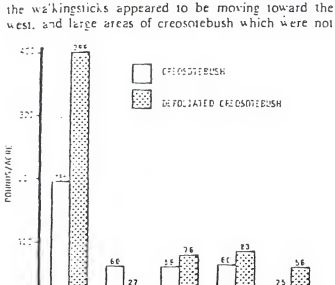
by Darrell N. Ueckert and A. Dean Chamrad

During the summer and fall of 1972, the walkingstick insect *Diapheromera covilleae* R. & H. (Orthoptera: Phasmidae) defoliated thousands of acres of creosotebush (*Larrea tridentata*) in the Trans-Pecos region of Texas. Infestations of these insects were widespread and their feeding resulted in essentially complete defoliation of creosotebush in localized areas. Defoliation did not kill creosotebush plants; however, it was felt that defoliation might reduce competition with native forage plants. In April, 1973 a clipping study was conducted to compare herbage production beneath defoliated and undefoliated creosotebush plants on a limestone hill range site northwest of Cornudas, Texas. Thirty-five 1-m² quadrats, each with a creosotebush plant at its center, were clipped in a stand of creosotebush heavily defoliated by walkingsticks, and 35 similar quadrats were clipped in an adjacent stand of creosotebush which had not been defoliated.

Defoliation of creosotebush increased production of primary grasses (black grama and blue grama) by 203 lb/acre (103%) and production of annual forbs (annual buckwheat and other annuals) by 31 lb/acre (122%). Defoliation did not significantly influence production of secondary grasses (spike dropseed, mesa dropseed, threeawn, and sand muhly) or perennial forbs (tagweed and perennial broomweed).

Walkingsticks continued to defoliate creosotebush in the Trans-Pecos region during the summer and fall of 1973. In the areas observed near Cornudas, Texas the walkingsticks appeared to be moving toward the west, and large areas of creosotebush which were not defoliated in 1972 had been defoliated by early fall 1973. Creosotebush that had been heavily defoliated during 1972 was maintained in a leafless condition by low population densities of walkingsticks in 1973.

Lottie Turner, a rancher near Cornudas, moved thousands of walkingsticks from heavily infested areas into walkingstick-free areas during 1972. Observations in late August, 1973 revealed that he had succeeded in establishing populations of walkingsticks in several new areas.

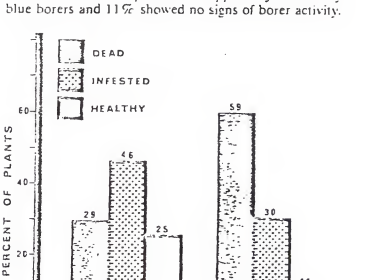


Estimate of production of primary, secondary, and low-value grasses and perennial forbs and annual forbs beneath stands of plants defoliated by walkingsticks and undefoliated creosotebush plants northwest of Cornudas, Texas in April, 1973.

Natural Control of Prickly pear

by Darrell N. Ueckert and E. B. Herndon

Various species of cactus (prickly pear, tasajillo, cholla, etc.) infest about 75 million acres of Texas rangeland. Prickly pear is well adapted to desert-like conditions and usually spreads during drought years or on rangeland that has been severely overgrazed. Over 90 species of insects injurious to prickly pear have been reported. A study was begun in 1972 to determine the impact of a blue cactus borer, *Olycella junctolinecta* (Hulst) (Lepidoptera: Pyralidae), on an infestation of prickly pear southeast of Quanah, Texas in Hardeman County. The larvae of this insect bore into the pads of prickly pear and consume the fleshy contents. By late August, 1972 the borers had killed 29% of the prickly-pear plants and 46% of the live plants were infested with borers. In late August, 1973 another survey of the prickly-pear plants on the study area was taken. This survey revealed that the mortality of prickly pear due to the borers had increased by 30%, i.e. 59% of all the prickly-pear plants had been killed by the blue borers. An additional 30% of the plants were apparently infested by blue borers and 11% showed no signs of borer activity.



Comparison of damage to prickly pear by the blue borer Olycella junctolinecta in late August, 1972 and late August, 1973 southeast of Quanah, Texas.

XIII. Cost of Benefits of the Principle Control (Conversion Method)

The cost of creosotebush control depends on the site and the degree of infestation. Control costs less when the invasion is just beginning and the plants are small and scattered.

In areas where creosotebush has attained a canopy cover density between 5-15%, a good grazing system may slow down if not stop the creosotebush invasion.(11)

In areas where creosotebush has attained a a canopy cover density between 15-30%, rootplowing, heavy discing, or spraying should be considered for control; and these are expensive, root plowing costs as much as $12.00 per acre and spraying $37.75 per acre (in 1968).(14)

GUIDELINES:

1. What can be expected in the change of productivity by converting brushland to grassland?
2. Determine the relationship between level of brush control and increase in forage production for different sites under various levels of precipitation.
3. What can we afford to invest in brush control on sites with various potentials for forage production considering short-term and long-term benefits.

XIV. Effects of Grazing

A. Historical Use

Testimony of travelers and military expeditions of the

19th century and of long-time residents of the valley points to the conclusion that the area was once grass covered except in certain limited areas. Shrubs were, however, probably scattered among the grasses in many places.

Many of these grasses have declined ovther the years. This is due to the following causes: climatic change (long period of drought), erosion, rodent and rabbit activity, improper grazing management, selective grazing, and the encroachment of shrubs.

B. Effects of no Grazing

Mere cessation of grazing to increase the grass cover on the creosotebush infested ranges has not indicated a reverse in trend from dominanace by creosotebush. No evidence has been observed that the long-lived creosotebush has been replaced by herbaceous plants.(11)

Nelson (1934), in a study of the effects of droughts and grazing on black grama, concluded that range that was conservatively grazed would recover from drought as rapidly as range which was not grazed. The density of conservatively grazed plots exceeded the density of ungrazed plots for several years of his study. He stated that conservatively grazed black grama formed more but smaller clumps which was better able to make use of the limited moisture.(2)

C. Effects of Heavy Grazing as Opposed to Moderate or Light Grazing

Creosotebush itself is unpalatable and livestock grazing within the 15-30% canopy cover is primarily restricted to the potholes and draws where the majority of the palatable forage grows (species include tobosa, blue grama, sideoats grama, and sacaton.) On the shallow, gravelly uplands within the 15-30% density creosotebush and where very sparse stands of black grama, dropseed, muhly, three-awn with plains bristlegrass mixed in, make up the palatable forage; light grazing or no grazing is essential. Heavy grazing on these areas would result in a weakening of plants so that they could not recover following droughts. The decrease in grass density would cause unstable woild conditions and an increased ranging of animals would cause trampling effects to develop, encourage erosion, and permit inferior plants to become established.(11)

D. Intensity of Grazing Use on Understory Forage Shrubs

High intensity grazing sets up a definite trend toward low vigor, and loss of plants if done on a continuous basis, but will stimulate tillering if plants are given a chance to recover after grazing.

E. The Effects of Compaction and Trampling

The major effect of trampling and compaction occurs where long distance ranging is necessary for animals to

find enough forage, thus creating many deeply incised trails. Also trampling and compaction problems around waters and feed areas do occur. Once compaction areas develop, it is hard to revegetate due to the high amount of run-off which occurs.

Animals will not graze far from water. They tend to stay close to it and overgraze and trample the vegetation in that vicinity.

XIV. Grazing Treatment Considerations

Grazing treatment considerations for the Creosote vegetative subtype are much the same as for mixed desert shrub, mesquite, and grassland vegetative subtypes. The reason for this is that the major forage on each of these sites is made up of warm season grasses having the same physiological requirements regardless of site. The major difference is in mechanical treatment practices and the limitation of the site to respond to management.

In the Cresote vegetative subtype, close attention must be paid to the soil, or to the SCS range site classifications. If the Creosote subtype occurs on the "Limestone Hills", or the "Shallow" range sites, chances are very good that improvement in the herbacious cover will be very slow, or will not occur, and the "typical" reaction as described under Effects of Livestock Grazing section, and Analysis of Treated Areas section, of this report will occur.

Creosote subtypes which occur on the "Limestone Hills", and "Shallow" range sites, and which have canopy covers of greater than 30% should not be considered as suitable range for livestock grazing as any use may accelerate the deteriorating condition.(11) On these same sites where canopy cover is from 15 to 30%, extreme caution should be taken in stocking, and class analysis of erosion potential on watersheds SSF factor must be considered.(11)

On the other range sites where creosote occurs, management can be applied in a more positive manner and especially if it is in combination with mechanical treatment practices.

Physiological requirement of the forage species is the primary consideration in selecting the proper grazing treatment system, from a livestock forage production standpoint.

Any grazing system selected must, as a minimum, meet the needs of warm season grasses, both those reproducing from seeds, and those reproducing from stolens.

Hormay and Talbot (1961) found that by allowing plants to regain vigor throughout one complete growing season, (March through October in this area according to phenological records in the Roswell District Office), the next year, one could expect good seed production.(17)

Tillering species need the have non-use provided beyond the growing season to allow tillers to develop in the fall, provide protection through the winter and allow for establishment

the following spring and summer of the new plants.[18][19] The non-use provides protection from trampling during the period when the new plants are still dependent on the mother plants for nutrients, through stolens.[20][21]

Climatic data compiled by the U.S. Weather Bureau and extracted in the Planning Unit Resource Analysis report indicate that about 2 out of every 5 years results in a much lower than normal precipitation. This low precipitation does not usually occur two years in a row.

In order to provide for optimum vigor and to better insure that a favorable climate year will occcur during a non-use period, 2 years of non-use in a row is necessary during the growing season.

In addition to the non-use treatments, it is both desirable and essential to provide grazing treatments.

Grazing, especially in the fall and winter helps to flatten litter, tramp it into the soil superficially, remove build-up of old plant residue which reduce palatability and productivity through harboring insects, fungus, and disease, and perhaps helps plants some seeds of seed reproduction species.[17] Grazing during the growing season on tillering species stimulates stolens to develop and tillering to take place.[22]

Continuous grazing one out of three years, two out of four years or three out of five years has been shown to be permissable

and in some cases, such as within a sod grass situation, even desirable if plant vigor has been restored, or is being maintained at a high level.(22)

Several grazing formulas can be developed to meet the requirements of this subtype, but one should always keep in mind all of the limiting factors of all the subtypes in association must be considered, and the system designed around the most restrictive needs of the subtypes involved.

In choosing the proper grazing formula for the area to be treated, 3 major factors, at least must be considered. They are:

1. Current and potential, specific stand density and composition

   The ratio between current and potential will dictate the intensity of the rest periods, and how many years grazing can be allowed between rests in order to maintain or achieve a desirable situation.

2. Climatic factors and primary desirable specie needs

   Depending on whether majority of forage plants are sod or bunch grasses, and what is desired, specific needs must be established, and then balanced with climatic factors to determine needed non-use cycles and frequencies.

3. Livestock Operation

   Number of herds which need to be accommodated, flexibility in moving dates, and number of moves which can be tolerated (in general, the fewer the moves tolerable, the

longer the rest period needed).

Information for item 1 must come fron an on-the-ground inventory, for item 2, from climatic data in the URA Step 2 for the planning unit or USWB publications, and for item 3, from the livestock operator. The basis for analyzing the information is contained in this, or the other 5 vegetative subtype descriptions prepared for use in the Roswell BLM District.

To insure success, stocking should not exceed the production of forage in the pastures available for grazing during any one year.(17) The key is to determine what that production is, under the system to be used.

RANGE PLANTS FOUND IN THE CREOSOTEBUSH SUBTYPE

GRASSES

Scientific	Common
Bouteloua eriopoda	Black grama
Bouteloua gracilis	Blue grama
Scleropogon brevifolius	Burrograss
Muhlenbergia porteri	Bush muhly
Erioneuron pulchellum	Fluffgrass
Bouteloua hirsuta	Hairy grama
Setaria macrostachya	Plains bristlegrass
Sporobolus wrightii	Sacaton
Boutelous curtipendula	Sideoats grama
Aristida spp.	Three-awn
Hilaria mutica	Tobosa

FORBS

Croton corymbulosus	Croton
Cassia romeriana	Senna
Zinnia spp.	
Lesquerella gardonii	Bladderpod mustard
Allunia incarnate	Trailing fourOclock
Krameria spp.	
Solanum elaegnifolium	White horsenettle
Euphorbia spp.	Spurge
Coldenia gossyping	

SHRUBS

Larrea tridentata	Creosotebush
Prosopis juliflora	Mesquite
Flourensia cernua DC	Tar-Bush
Microrhamnus eridoides	Javelina brush
Dalea formosa	Feather dalea
Gutierrezia sarothrae	Broom snakeweed
Ephedra trifurca	Mormon tea

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